
Marine Physical Laboratory

Acoustic Array Hardware Development and Bottom Reverberation Experiment

W. S. Hodgkiss

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Abstract

Four 64-element, large dynamic range, acoustic arrays and autonomous recording capsules were designed and fabricated for deployment in the major bottom acoustics experiment of the ONR Acoustic Reverberation Special Research Program (ARSRP). Subsequently, these arrays and recording capsules were taken to sea and recorded bistatic scatter during the July 1993 bottom reverberation experiment.

Research Objective

The objective of this project was to develop four 64-element, acoustic arrays and autonomous recording capsules and to deploy these sensor systems during the July 1993 ONR ARSRP bottom reverberation experiment.

Research Summary

Each of the four reverberation arrays consists of 64 hydrophone elements with 1.875 m interelement spacing ($\lambda/2$ at 400 Hz). The time series from the array elements is sampled at $f_s = 1.5$ kHz using 24 bit A/D converters

and multiplexed onto a single digital data stream for transmission to the data recording package. In addition, there are 16 navigation receivers embedded in each array for localizing the array elements. These navigation receivers detect transponder arrivals in the 7.5-14.5 kHz band. A more detailed discussion of the hardware design is contained in [1].

Each of the four autonomous recording packages makes use of a 24" diameter aluminum pressure vessel as the primary electronics housing. The array digital data stream will be recorded on an Exabyte-8500 8 mm cassette recorder (5 GB/tape). The capability of recording several of these tapes is provided by an Exabyte 10 cassette stacker to provide a total storage capacity of 50 GB. Real-time management of the array data and stacker is provided by a CMOS 68000 CPU. In addition, the CPU interrogates a transponder net for array element localization purposes.

The ARSRP bottom reverberation experiment was carried out in the vicinity of the Mid-Atlantic Ridge in July 1993. Three ships participated in the experiment - the M/V Cory Chouest, the R/V Alliance, and the R/V Knorr. W. Hodgkiss was Chief Scientist on the R/V Knorr as well as Chair of the Acoustics Experiment Working Group which planned the experiment. The Cory Chouest deployed a vertical line source array and a horizontal line receive array, the Alliance deployed a flextensional source and a horizontal line receive array, and the Knorr deployed both the vertical, near-bottom reverberation arrays and recording packages as well as the DTAGS (Deeply Towed Acoustics Geophysics System).

The bottom reverberation experiment was very successful and all three ships collected a substantial amount of both monostatic and bistatic reverberation data. An intercomparison of the autonomous vertical line array and DTAGS data is contained in [2,3]. The activities of the R/V Knorr during the 7 July - 2 August 1993 sea trip are documented in a trip report [4]. Lastly, a quick-look analysis of the data quality across the entire data set recorded by the vertical arrays is documented in [5].

References

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